

Description of Two New Species in the Genus
Agelas (Demospongia) from Zamami Island,
the Ryukyus, Japan¹⁾

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Synopsis

HOSHINO, T. 1985—Description of two new species in the genus *Agelas* (Demospongia) from Zamami Island, the Ryukyus, Japan. *Proc. Jap. Soc. syst. Zool., Tokyo*, No. 30: 1-10, Pls. I-II.

Two new species in the genus *Agelas*, family Agelasidae, *A. nakamurai* and *A. nemoechinata*, are here described. The former species has longer spicules than those of other members of the genus and has secondary fibers which are irregularly reticulated; in the latter, the fibers are only slightly echinated. The genus has hitherto been diagnosed as having the acanthostyles verticillately spined and the fibers cored with no spicules. From the observations on the two species treated in this paper, the diagnosis for the genus is emended that the fibers are cored, or occasionally not cored, with spicules, and that are echinated or occasionally not echinated. The position of this problematic monogeneric family Agelasidae should be in the order Axinellida (subclass Tetractinomorpha). The genus is distributed from tropical to subtropical areas, and may be found in certain temperate areas as well.

Two species of shallow water demosponges from Zamami Island, the Ryukyus, have been entrusted to the writer for study by Dr. H. Nakamura of the Mitsubishi-Kasei Institute of Life Science. Both of the species are in the genus *Agelas* of the family Agelasidae and new to science.

The genus *Agelas* is very interesting from a systematic viewpoint in that it has a well developed, fibroreticulated skeleton similar to that found in the order Dictyoceratida, and it is oviparous as in the subclass Tetractinomorpha.

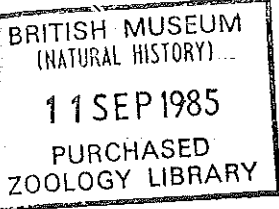
No species of the genus has previously been reported from Japanese water or neighboring areas.

Order AXINELLIDA LEVI, 1955

Family Agelasidae VERRILL, 1907

Diagnosis. The sponge shape is variable. The skeleton is a reticulation of fiber which may be cored with acanthostyles to a variable

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degree, and which is, or occasionally not, echinated by acanthostyles. The acanthostyle is verticillately spined. No other spicules are present.

Remarks. The monogeneric family Agelasidae has been problematic for many years. Recently, several workers have published important observations that helped clarify the systematic position of the genus *Agelas*. BERGQUIST and HARTMAN (1969) have shown that the free amino acid pattern of the genus *Agelas* is similar to that of sponges in the order Axinellida. REISWIG (1976) observed three Caribbean species of *Agelas* releasing oocytes and concluded that the family Agelasidae should be translocated from the subclass Ceractinomorpha to the order Axinellida of the subclass Tetractinomorpha which is oviparous. BERGQUIST (1978) also transferred the genus *Agelas* to the order Axinellida. However, sponges of the genus *Agelas* remain peculiar, even if it is in Axinellida, from the viewpoint of spicule and skeletal morphology.

Other biochemical evidence also suggests that the family Agelasidae is closely allied to the order Axinellida. CIMINO *et al.* (1976) discuss the presence (or absence) of a dibromotyrosine-derived compound, furanoterpene and bromopyrrole derivatives in 52 species of demosponges. According to them, bromopyrrole derivatives have been found in five different species, *Agelas oroides*; *Agelas* sp.; *Phakellia flabellata*; *Axinella danicornis*; and *Axinella verrucosa*. Moreover, according to Dr. H. NAKAMURA who is studying bioactive compound, one of bromopyrrole derivatives, oroidin, was isolated from the first new species in this paper (*Agelas nemoechinata*), but not from *Agelas nakamurai* (per. com.).

Although the genus *Agelas* was assigned to the order Poecilosclerida (subclass Ceractinomorpha) on the basis of its spicules and skeleton, the recent observations on developmental mode (oviparity) and biochemical affinities make it clear that the genus *Agelas* belongs to the order Axinellida (subclass Tetractinomorpha).

Genus *Agelas* DUCHASSAING et MICHELOTTI, 1864

Agelas DUCHASSAING et MICHELOTTI, 1864, p. 76.

Agelas: RIDLEY et DENDY, 1887, p. 163; DENDY, 1905, p. 174; HENTSCHEL, 1911, p. 391;

BURTON et RAO, 1932, p. 355; DE LAUBENFELS, 1936, p. 73; HECHTEL, 1969, p. 20;

BERGQUIST, 1978, p. 168; WIDENMAYER, 1977, p. 128.

Ectyon GRAY, 1867, p. 520.

Ectyon: CARTER, 1871, p. 268; 1882, p. 281; 1883, p. 310; DENDY, 1922, p. 72.

Oroidea GRAY, 1867, p. 520.

Chalinopsis SCHMIDT, 1870, p. 59 (fide DE LAUBENFELS, 1936, p. 74).

Pachychalinopsis SCHMIDT, 1870, p. 80 (fide WIDENMAYER, 1977, p. 128).

Siphonochalinopsis SCHMIDT, p. 80 (fide WIDENMAYER, 1977, p. 128).

Diagnosis. The same as the diagnosis for the family.

Remarks. On the definition of the genus *Agelas* and the family Agelasidae, it is confirmed that the acanthostyle is verticillately spined and the fiber is echinated by its acanthostyles. But there are contrary observations on whether the fiber is cored with spicules. Several authors have stated that "spongin fiber is not cored at all" (DE LAUBENFELS, 1936), "the spongin fibers contain no coring spicules" (BERGQUIST, 1978), and the fiber is "fibreuse reticulee, aspiculaire" (LEVI, 1973). On the other hand, WIEDENMAYER (1977) stated that the spicules may core the fibre to a variable degree. In the present study, the writer observed that both the new species described herein have the fiber cored with acanthostyles. Therefore, the diagnosis for the genus *Agelas* should be that the fibers are cored, or occasionally not cored, with acanthostyles. Furthermore, since the second new species in this paper is hardly echinated by acanthostyle on the fiber, the diagnosis of the genus should be that the fiber is, or occasionally not, echinated by acanthostyle.

Brief note on the distribution of the Agelas. Sixteen species of the genus *Agelas* have been hitherto reported from the world as follows:

1. *Agelas dispar* DUCHASSAING et MICHELOTTI, 1864
West Indies, Brasil, 15-75 m in depth.
2. *A. oroides* (SCHMIDT, 1864)
Mediterranean Sea, 0-50 m in depth.
3. *A. fascicularis* (GRAY, 1867)
West Indies.
4. *A. carpernteri* (GRAY, 1867)
West Indies.
5. *A. clathrodes* (SCHMIDT, 1870)
West Indies, 5-10 m in depth.
6. *A. conifera* (SCHMIDT, 1870)
West Indies, 5-10 m in depth.
7. *A. flabelliformis* (CARTER, 1883)
West Indies.
8. *A. mauritiana* (CARTER, 1883)
Indian Ocean, West Central Pacific, 2-70 m in depth.
9. *A. schmidti* WILSON, 1902
West Indies, 1-150 m in depth.
10. *A. cavernosa* THIELE, 1903
Ternate.
11. *A. ceylonica* DENY, 1905
Indian Ocean, 42 m in depth.

12. *A. axifera* HENTSCHEL, 1911
Champion Bay, Geraldton Meeresstrand.
13. *A. marmarica* LEVI, 1958
Marmar, Red Sea, 20-30 m in depth.
14. *A. bispiculata* VACELET, VASSER et LEVI, 1976
Tulear, 9-12 m in depth.
15. *A. robusta* G. PULITZER-FINALI, 1982
Hong Kong, shallow water.
16. *A. novaecaledoniae* LEVI, 1983
New Caledonia, 390-395 m in depth.

Agelas dispar, originally described by DUCHASSAING and MICHELOTTI (1864) from the Caribbean Sea, is reported from throughout the West Indies and Brazilian coast. *A. schmidti*, *A. flabelliformis*, *A. clathrodes*, and *A. conifera* were also reported from the West Indies. From the Mediterranean, only *A. oroides* was reported. Furthermore, *A. ceylonica* was reported from Ceylon and the Indian Ocean, and *A. mauritiana* from the Indian Ocean and the West Central Pacific. Other species have been reported from Mauritias Island, the east coast of Australia, Ternate, Hong Kong and the Red Sea. As apparent from the above, the distribution of the genus *Agelas* is limited primarily to tropical and subtropical waters, though part of it runs to temperate areas. Distribution of the six representative species is shown in Fig. 1.

The bathymetric distribution of the genus is mostly in shallow waters to a depth of 20-30 m. In a few cases, collections have been made from 50 m or deeper.

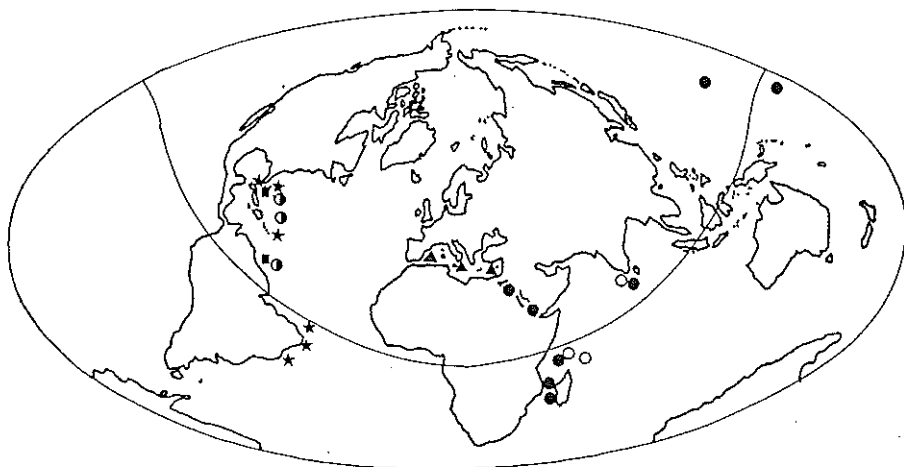


Fig. 1. Distribution of the six representative species of *Agelas*. Solid circle; *A. mauritiana*: Open c.; *A. ceylonica*: Half s. c.; *A. clathrodes*: Solid triangle; *A. oroides*: S. star; *A. dispar*: S. square; *A. flabelliformis*.

Agelas nakamurai n. sp.

(Fig. 2; Pl. I, Figs. 1-5)

The material examined consists of one specimen, $6 \times 5 \times 4$ cm in size, collected by H. NAKAMURA from Zamami Island of the Ryukyus; accordingly this specimen is the holotype.

The sponge is massive, rounded or thickly encrusting. The color is orange rufous to brick red on the exterior of the dry specimen, somewhat lighter inside. Its tint in life is similar to that of the dry state. The consistency is firmly spongy, resilient when wet; very hard, hardly compressible when dry. The surface is smooth, uneven, provided with irregularly meandering surface grooves, 1-4 mm in width and 1-2 mm in depth. Deep, irregular, elliptical hollows exist in places of the surface. The ectosome consists of a thin skin and acanthostyles which are distributed irregularly and horizontally. The endosome skeleton consists of a network of primary ascending fibers and reticulated secondary ones. The primary fibers, 70-100 μ m in diameter, cored with four to eight or more rows of acanthostyles, and echinated by the same acanthostyles as those in the fibers with intervals of 70-150 μ m, ascend, ramifying in places, to surface, about 1 mm apart beneath the ectosome. The secondary fibers, variable in diameter from 20 to 70 μ m, and not cored but echinated by acanthostyles in places, form a reticulation of variably sized, elliptical meshes, 40-200 μ m in diameter. The spicule is acanthostyle only, straight to slightly curved, of a similar thickness throughout

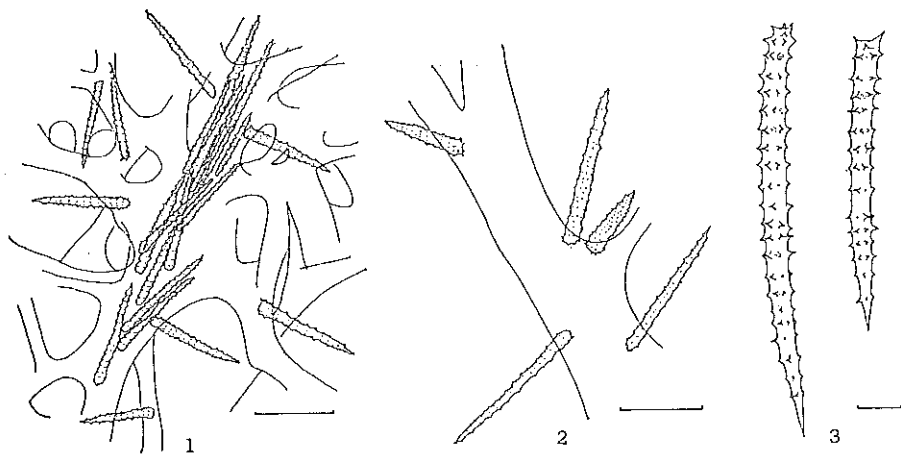


Fig. 2. *Agelas nakamurai* n. sp. 1, Endosome skeleton. Scale: 100 μ m. 2, Secondary fiber echinated by acanthostyles, Scale: 50 μ m. 3, Spicules, verticillately spined acanthostyles. Scale: 20 μ m.

its length, with one end sharply pointed. The acanthostyle is verticillately spined; and the spine whorls number from 15 to 23 (mean: 18), each having seven to eight spines. The spines on this spicule are sharp and conical, and reach $5\ \mu\text{m}$ in height. The spicule measures $185\text{--}226$ (mean) $\times 8\text{--}12\text{--}15\ \mu\text{m}$.

Holotype. One specimen (H. NAKAMURA leg.), from coast of Zamami Island, the Ryukyus, 20 m in depth, 1982-X-29. Depository: Mukaishima Marine Biological Station, Reg. No., JAP-194.

Remarks. Although this species is similar to *Agelas dispar* DUCHASSAING et MICHELOTTI (senior synonym for *Agelas sparsus* (GRAY)) in external appearance, it clearly differs from the latter in two respects: 1) the spicule of the new species reaches nearly twice the length of that in *A. dispar*; and 2) the secondary fibers of *A. nakamurai* are irregularly reticulated.

Agelas nemoechinata n. sp.

(Fig. 3; Pl. II, Figs. 1-4)

The material examined consists of one specimen, $5 \times 4 \times 3$ cm in dimension, collected by H. NAKAMURA from Zamami Island, the Ryukyus, and accordingly this specimen is the holotype.

This sponge is massive or thickly encrusting. The color is madder brown on the exterior and orange rufous in the interior when dry. The tint in life looks similar to that when dry. The consistency is very spongy, resilient when wet; hard and difficult to compress when dry. The top surface is uneven, honeycomb-like, provided with numerous variable oscules or cavities which are round or elliptical in shape, 1-3 mm in diameter, and 2-3 mm apart, and irregularly meandering shallow grooves running on the sponge surface between oscules. A portion of the side surface is somewhat even, weakly conulose or not conulose, and opening into several large oscules, 5-8 mm in diameter. The ectosome skeleton consists of an erect conule tract and a thin skin, and in places shows a confused arrangement of acanthostyles. The conule tract is formed of ten or more acanthostyles, and is $15\text{--}70\ \mu\text{m}$ in diameter and $300\text{--}400\ \mu\text{m}$ in height. The endosome skeleton consists of a vaguely isotropic to anisotropic fibroreticulation of elliptical meshes. The primary and secondary fibers are almost indistinguishable. Both the types of fibers are cored with solitary to triple acanthostyles, or occasionally not cored; are only slightly echinated; and are $20\text{--}50\ \mu\text{m}$ in diameter. Fibers cored with multiple spicules are found in places, however rarely. The mesh size varies from 50 to $250\ \mu\text{m}$ in diameter. The acanthostyle is straight to gently arched, and exhibits a nearly

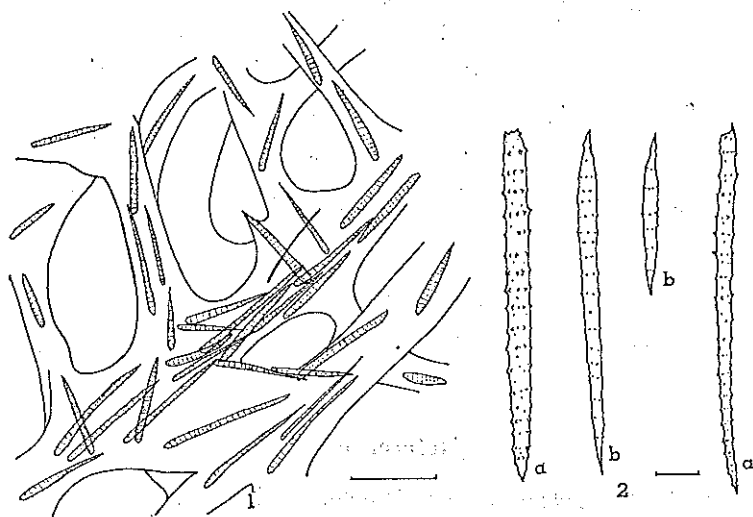


Fig. 3. *Agelas nemoechinata* n. sp. 1, Endosome skeleton. Scale: 100 μm . 2, Spicules, verticillately spined acanthostyles. a, acanthostyles with round base spined. b, acanthostyles with oxate base. Scale: 20 μm .

constant thickness throughout its length with one end, occasionally at each ends, sharply pointed. The spicule measures 170–189–210 \times 9–11–13 μm and has 16 to 23 (mean: 19) regular whorls, each possessing six to eight spines. The spine is conical, not very sharp, and up to 3 μm in height.

Holotype. One specimen (H. NAKAMURA leg.), from coast of Zamami Island, the Ryukyus, 20 m in depth, 1982-X-29. Depository: Mukaishima Marine Biological Station, Reg. No., JAP-195.

Remarks. This species clearly differs from other members of the genus in that the fibers are only very slightly echinated by acanthostyles.

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摘 要

星野孝治 (広島大学理学部付属向島臨海実験所)——座間味島 (琉球列島) 産 *Agelas* 属 (尋常海綿) 2 新種の記載.

座間味島で採集された尋常海綿 *Agelas* 属の 2 新種 *A. nakamurai* と *A. nemoechinata* を記載した. 前種は同属内の他種に比して非常に長い骨片を持ち, 後者は骨格繊維からほとんど骨片が射出していないことを特徴とする. *Agelas* 属の海綿はこれまでに熱帯あるいは亜熱帯海域から 16 種が記録されている. *Agelas* 属は 1 属で 1 科を構成し, 従来は多骨海綿目 (珪角海綿亜綱) に所属するものとされてきたが, 骨片・骨格以外のいろいろな知見が得られるにつれて中軸海綿目 (四放海綿亜綱) に所属させるべきであると考えられるようになった.

References

- BERGQUIST, P. R. 1978. Sponges, 268 pp. Hutchinson, London.
- BERGQUIST, P. R. and HARTMEN, W. D. 1969. Free amino acid patterns and the classification of the Demospongiae. *Mar. Biol.*, 3: 247-268.
- BOURY-ESNAULT, N. 1971. Spongiaires de la Zone Rocheuse Littorale de Bonyulus-sur-Mer, II. Systématique. *Vie et Milieu*, 22: 287-350.
- 1973. Spongiaires. *Res. Sci. Camp. "Calypso"*, 10: 263-295.
- BOWERBANK, J. S. 1864. A Monograph of the British Spongiidae, Vol. 1. 388 pp. Ray Society, London.
- BURTON, M. and H. S. RAO 1932. Reports on the shallow-water marine sponges in the collection of the Indian Museum. *Rec. Ind. Mus., Calcutta*, 34(3): 299-356.
- CARTER, H. J. 1871. On two undescribed sponges and two Esperiadae from the West Indies; also on the nomenclature of the Calesponge Clathrine, GRAY. *Ann. Mag. nat. Hist.*, ser. 4, (7): 268-283.
- 1882. Some sponges from the West Indies and Acapulco in the Liverpool Free Museum described, with general classificatory remarks. *Ibid.*, ser. 5, (9): 26-301.
- 1883. Contributions to our knowledge of the Spongida. *Ibid.*, ser. 5, (12): 308-329.
- CIMINO, G., STEFANO, S. DE, MINALE, L., and SODANO, G. 1975. Metabolism in Porifera. III. Chemical patterns and the classification of the Demospongiae. *Comp. Biochem. Physiol.*, 50B: 279-285.
- DUCHASSAING, F. P. DE and G. MICHELOTTI 1864. Spongiaires de la Mer caraibe. Memoire publie par la Societe hollandaise des sciences a Harlem. *Natuurk. Verh. Mij. Haarlem*, 21: 1-124.
- DENDY, A. 1905. Report on the sponges collected by Professor HERDMAN, at Ceylon, in 1902. *Herdman Rept. Pearl Oyster Fisheries Gulf of Manaar*. Suppl. XVIII: 57-246, Pub. Roy Soc. London.
- 1922. Report on the Sigmatotetragonida collected by H. M. Sealark in the Indian Ocean. *Trans. Linn. Soc. London.*, 18 (1): 1-164.
- GARY, J. S. 1867. Notes on the arrangement of sponges, with the description of some new genera. *Proc. zool. Soc. London*, pp. 492-558.
- HECHTEL, G. J. 1969. New species and records of shallow water demospongiae from Barbados, West Indies. *Postilla*, (132): 1-38.

- H5&TSCHEL, E. 1911. Tetraxonida. 2 Teil: Die Fauna Sudwest-Australiens. (MICHAELSEN und HARTMEYER). Vol. 3, pp. 279-393.
- LAUBENFELS, M. W. DE 1936. A discussion of the sponge fauna of the Dry Tortugas in particular and the West Indies in general, with material for a revision of the families and orders of the Porifera. *Pap. Tortugas Laboratory*, 30: 1-225.
- LEVI, C. 1958. Spongiaires de Mer Rouge, Recueillis par la Calypso (1951-1952). *Ann. Inst. Ocean. (Monaco)*, 34: 3-46.
- 1973. Systématique de la Classe des Demospongiaria (Demosponges). In GRASSE, *Traité de Zoologie*, 3: 577-631. Masson et C^{ie}, Paris.
- LEVI, C. and P. LEVI 1983. Démosponges bathyales récoltées par le N/O « Vauban » au sud de la Nouvelle-Calédonie. *Bull. Mus. natn. Hist. nat., Paris*, 4^e ser., 5 sect. A, No 4: 931-997.
- PULTZER-FINALI, G. 1982. Some shallow water sponges from Hong Kong. The marine flora and fauna of Hong Kong and Southern China. *Proc. First Inter. Mar. Biol. Works*, pp. 97-100.
- REISWIG, H. M. 1976. Natural gamete release and oviparity in Caribbean Demospongiae. In HARRISON, F. W (ed.), *Aspect of Sponge Biology*, pp. 99-112. Academic Press, London.
- RIELEY, S. O. and DENDY, A. 1887. Report on the Monaxonida collected by H. M. S. Challenger during the year 1873-1976. *Rep. Sci. Results Voyage Challenger Zool.*, 20: 1-275.
- THIELE, J. 1903. Kieselschwamme von Ternate. II. *Abh. senkenb. natf. Ges.*, 25: 933-968.
- VACELET, J. et VASSEUR, P. 1976. Éponges des Recifs coralliens du Tulear (Madagascar). *Tethys*, Suppl. 1: 51-126.
- WIEDENMAYER, F. 1977. Shallow-water sponges of the Western Bahamas. *Experientia*, Suppl. 28: 287 pp.
- WILSON, H. V. P. 1902. The sponges collected in Porto Rico in 1899 by the U.S. fish. Commission Steamer Fish Faek. *Bull. U.S. Fish. Comm.*, 2 for 1900: 375-411.

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Explanation of Plate I

Agelas nakamurai n. sp.

1. Holotype specimen, top view. Scale: 3 cm.
2. Holotype specimen, side view. Scale: 3 cm.
3. Endosome skeleton. Scale: 200 μm .
4. Endosome skeleton. Scale: 50 μm .
5. Spicule. Scale: 20 μm .

Explanation of Plate II

Agelas nemoechinata n. sp.

1. Holotype specimen, top view. Scale: 3 cm.
2. Endosome skeleton. Scale: 200 μm .
3. Endosome skeleton. Scale: 50 μm .
4. Spicules. Scale: 100 μm .

